

ALFALFA

THE MONEY CROP

You!
Can grow
Alfalfa
on your farm
This book tells you how!

ALFALFA

THE MONEY CROP

ANSWERS TO VITAL ALFALFA QUESTIONS

THE FUNDAMENTAL FACTS TO
KNOW AND REMEMBER IN
ALFALFA GROWING

BY

WILLIAM C. SMITH

DELPHI, INDIANA

AUTHOR OF "HOW TO GROW 100 BUSHELS OF CORN PER ACRE ON WORN SOIL,"
"THE BOOK OF VETCH," AND "THE BUSINESS OF FARMING."

PRICE 25 CENTS

Copyright, 1914, by William C. Smith, Delphi, Indiana

PUBLISHED BY

DOUGLAS M. SUTHERLAND

MILWAUKEE, WISCONSIN



An Alfalfa plant from the writer's Vetchalfa Farm at Delphi, Ind. The main roots are six feet in length and at ends are one-fourth inch in diameter, showing that they extended to a great depth into the soil

INTRODUCTION

The writer of this book, William C. Smith of Delphi, Ind., is well known throughout the United States as an authority on agricultural matters.

Mr. Smith's farm books are written with the authority that comes from actual experience. All his life he has been a farmer, a business farmer. He is firm in the belief that in the near future agriculture will be the greatest **business** in the country.

To increase efficiency on the farm and to put it on a more scientific basis is the aim of his book "The Business of Farming."

On his own farm he has practically demonstrated how to build up worn-out land and poor sandy soil by growing hairy vetch. Just how he did this is told in his "The Book of Vetch." This, without a doubt, is the most valuable book ever written about the great fertilizing value of vetch, the king of soil builders.

The third book Mr. Smith has written is called "How to Grow 100 Bushels of Corn per Acre on Worn Soils." Like his vetch book, it tells the reader how to double the yield of his corn and other crops by building up his soil. He shows the reader just **how** to do this by telling him just how it was done on Smith's farm.

Mr. Smith writes in a style every reader "takes to" at once. His facts and figures, his farm methods and practices based on personal experience, become as lucid, vivid and interesting as moving-picture films and are always instructive and reliable.

There is nothing technical about his books. Any boy or girl ten years of age can read them with profit.

This book, "Alfalfa, The Money Crop," is Mr. Smith's latest publication. It deals only with those primary lessons which the reader **must** learn if he hopes to grow alfalfa. These lessons are in the form of Questions and Answers in order to bring out each vital fact in a simple, clear-cut manner.

Any farmer who wants to grow alfalfa on his farm, can do so if he faithfully follows the instructions given him in this book.

Address the undersigned for information regarding Mr. Smith's three books mentioned above.

D. M. SUTHERLAND,
Milwaukee, Wisconsin.

PREFACE

The facts briefly stated in this book are in part the results of personal observation and experience on my "Vetchfalfa Farm" at Delphi, Indiana.

But before I started to grow alfalfa I had read what many experienced growers of the crop had to say on the subject and found this accumulated wisdom and experience of others very helpful.

The aim of this book is to give you the alfalfa information I have acquired both from reading and actual experience, so that you too can start right in to become an alfalfa grower. I have boiled the matter down so that you may be able to get straight at the essential facts without any padding or technical frills.

To make the problem as simple and easy as possible, this book gives you Answers to the leading Questions, together with a list of definite things you must avoid doing.

After you have carefully read this book I believe you will no longer put off growing a crop that will be of such great value to your farm.

You will start in **now** preparing your land for alfalfa, the crop that transformed Kansas farmers into wealthy nabobs, the mint that coins pork into dollars, the wonder crop that possesses the alchemic art of transmuting worn-out soil into "pay dirt" that is worth more to our agricultural economy than any grain or grass grown upon the American farm.

Follow the instructions given you in this book—not in one or two particulars, but in every important detail—and you will be able to grow alfalfa on your farm as easily as you now grow wheat or corn.

Yours very truly,

William C. Baugh

ANSWERS TO QUESTIONS

Why is there at present such an "Alfalfa Craze" throughout the United States? Why is everybody talking Alfalfa?

It is because agriculture is the basis of all prosperity and it is believed that "alfalfa growing on every farm will revolutionize agriculture:" we will all be better off. Our soil will be more fertile, our farms more valuable, our crops bigger and better, our children better educated, our homes happier, and we will all be better citizens.

Can I grow Alfalfa on my farm?

Yes, if you have soil with a water level at least five feet from the surface and if you will read carefully the directions given you in this book. Alfalfa roots penetrate so deeply into the earth, it does not thrive where the water table is too near the surface. It loves deep soils that are easily penetrated. If you expect your alfalfa to last for many years the water table should be at least five feet or more from the surface. Remember that the alfalfa root is the foundation of the plant and when it is strong and vigorous the whole plant thrives with greater power to fight its enemies.

Why should I grow Alfalfa?

Because your land is worth as much money as your crops will pay interest on. Make your farm pay ten per cent. on \$500.00, or more per acre by growing alfalfa.

Here is another reason. If you will grow twenty acres, or more, of alfalfa with a good stand and put the crop in your barn in good condition, and then feed it intelligently in connection with corn, corn stover or silage, you will soon find yourself on the right road to prosperity.

What makes Alfalfa such a valuable crop?

There are many facts and figures that prove the great value of alfalfa, but space will only permit me to give a few of them here. A well-established alfalfa field will yield five tons to the

acre. This is easily worth \$10.00 to \$15.00 per ton, since alfalfa hay has very nearly the same value as a feed, as wheat bran, thus it yields good interest on a valuation of \$250.00 per acre. Many authorities place it higher than this. At an Illinois farmers' institute it was computed that an average crop of alfalfa, five tons per acre, makes land worth at least \$1,000.00 per acre at five per cent.

Does Alfalfa improve the soil?

Yes, its deep feeding roots being marvelous renovators, improve the drainage, provide better ventilation of soil and reclaim hitherto unreached minerals or plant foods from the sub-soil, bringing them nearer the surface, where shallow-rooted crops can make use of them. The soil is also enriched in nitrogen taken out of the air by the germs which live in the roots of the alfalfa plant.

Is Alfalfa difficult to grow?

Yes, if you don't know how. That's why I have written this book; that's why I want you to read the book—for after you have read it these difficulties will **fade away** and you can grow alfalfa just as easily as thousands of other farmers are growing it, and make the same **big profits** they are making.

On what soils will Alfalfa grow?

On almost any type of soil, from light sandy or gravelly loams and mucks, to heavy clays, if water table is five feet from surface, if soil is sweet and well drained, and the alfalfa seed properly inoculated. Hardpan, of course, must be broken up or avoided altogether.

Muck soils will grow alfalfa but they must be drained and supplied with mineral plant food. Potash is nearly always lacking in muck soils and very often phosphorus and lime must also be supplied.

On what soil does Alfalfa refuse to grow?

On all sour soils, on water-logged soils, soils with water lying within three feet of the surface, and soils which become covered with water during the growing season for two days or more, are not suitable for alfalfa.

What is the ideal sub-soil for Alfalfa?

One with a loose gravelly texture that the deep roots can easily penetrate. However, a stiff sub-soil is no serious obstacle unless it is a solid "hard pan."

Is a level or sloping field best for Alfalfa?

A sloping field should have the preference over a level field. On level fields there are often times when water or ice is likely to cover the crowns which smother alfalfa. The plant will die if the crown is covered by water or ice for any length of time.

Would I fail if I tried to grow Alfalfa on land having a water level of less than five feet?

Where the water table is less than five feet from the surface, failure is very likely. If it is less than three feet, failure is certain.

Why?

At that depth, standing water drowns out the alfalfa.

Yet it is said that alfalfa requires a great amount of water.
It does, but not standing water.

How much?

Well, taking red clover as a basis, it is pretty safe to say that in making one pound of dry alfalfa hay from 400 to 500 pounds of water are required. Let us call it 450 pounds. At that rate it takes 450 tons of water to grow one ton of alfalfa hay. This shows how necessary it is that your alfalfa soil has a great water-holding capacity.

How is the water holding capacity of land increased?

First, by deep draining. You see that lets the roots feed down deep.

Second, by deep plowing.

Third, by using subsoil plow. In many soils, the third method is a big factor in increasing the yield of alfalfa in dry years.

Why must Alfalfa land be well drained?

If not drained the alfalfa tap root encounters water upon its downward path before it gets very far and its growth is

immediately stopped. This deprives the growing plant of the support from plant food drawn from the deep sub-soil.

Soil must have air in it or the useful bacteria cannot live; you never find them in water-clogged soils. Thus well-drained soils are best for alfalfa. Never attempt to grow alfalfa on a marsh or on a water-clogged clay that stands full of water half the year. While an occasional overflow of a stream may do little harm if the water is moving swiftly, even a few hours of stagnant water covering the land in hot weather may kill your alfalfa. It robs the useful bacteria of oxygen and they are destroyed.

Moreover, on soils overlying heavy clay or hard pan sub-soils great care must be taken to provide free escape of surface water. Alfalfa will soon die where water stands for a few days.

What causes soil to heave the Alfalfa?

Either poor drainage, lack of humus, or both.

How can water level be easily determined?

By digging a trench four and one-half feet deep and if water collects at the bottom continually it will be evident that the drainage at that point is insufficient.

Is Alfalfa an early plant?

Yes, the first cutting being four weeks earlier than red clover.

How deep should I plant Alfalfa?

Plant very shallow—from one-half to one and one-half inches deep. If seeds are covered three inches deep the young plant has a very slim chance of ever reaching the surface.

Should Alfalfa be used in rotation?

It is a crop having great value when used in rotation, but it is not usually practical, however, to make use of it in a short rotation system. Where growers are able to raise their own seed, it may be practical.

How about manuring Alfalfa?

It is a good practice. Give the growing crop a well scattered dressing of rotted manure in the early winter.

Must the soil be limed before planting Alfalfa?

Yes, if it is acid or sour. Alfalfa will not grow in acid soil. It never survives more than a few months at most in sour soil, if it grows at all.

Why won't Alfalfa grow in acid or sour soil?

The chief reason is that the acid in the soil kills the bacteria or germs which must be present. These germs are the little bees which extract the honey (nitrogen) from the air. They must be present on the roots of the growing alfalfa plant for absorbing nitrogen from the air and feeding it to the alfalfa plant. Hon. F. D. Coburn, in his treatise on alfalfa says:

“Alfalfa * * * after the first few months of its life, obtains its whole supply of nitrogen from the air.”

Why is lime so necessary to Alfalfa?

Alfalfa is a great lime feeder, there being in every ton of alfalfa hay nearly 50 pounds of lime taken from the soil. Lime makes the helpful bacteria thrive; they cannot exist without it. It is for this reason, more than anything else, that, every year, more and more lime is being used by successful alfalfa growers.

What different kinds of lime can be used?

Caustic lime, if evenly distributed, and if not used in too great quantities can be used. Burned lime is known as caustic lime.

Air-slacked lime,—which is burned or caustic lime slacked in the air—is a convenient and safe form of lime to use.

Marl, taken from marl beds, dried, powdered and put into bags for shipment is a safe and sure form of lime.

Ground limestone is another safe and convenient form of lime. It is simply the raw limestone ground to a fineness suitable for agricultural use.

What is the best kind of lime for Alfalfa?

I have found that caustic lime, if used in too great quantities, or if not evenly distributed over the land, often injures the soil. Burned lime, before it slacks, is caustic lime. There is little danger in its use if allowed to have time to become "air-slacked." If burned lime is put into small piles so the air can reach it, in time it will disintegrate into a powdered form. It usually takes about a year for burned lime to become air-slacked.

My advice to you is to buy ground limestone provided you can buy it under \$3.00 a ton including freight charges. Ground marl is also good, many believing it to be as good or better than the carbonate of lime. Remember that you will never get your soil rich in either nitrogen or phosphorus unless it is first rich in carbonate of lime:

How much lime shall I use?

Without knowing the needs of your soil this question is somewhat difficult to answer. Never use more than two tons to the acre of caustic lime, for it may do you more harm than good. In fact, I advise that you never use caustic lime except where you find it much cheaper than the ground limestone, or carbonate of lime. The carbonate will never harm your soil. You can put on 50 tons of it and it will do your soil no injury. Just how much of it you should use can be best determined by testing your soil for acidity with litmus paper.

When is it best to apply lime?

It is not well to put lime on a field at the same time with manure, or it will be likely to attack the manure and set free considerable nitrogen which will escape before the plant can make use of it. Never plow under your lime or your surface soil will not get the benefit from it, and it is the surface soil that needs the lime, because it is more apt to be acid, and also because the alfalfa germs and other helpful bacteria remain near the surface. It takes some time for lime to perform its work, hence it is well to get it on your land at least a few weeks ahead of seeding. With this in mind you can apply the lime whenever it is most convenient for you to do so.

How can I make the litmus test for soil acidity?

The litmus paper test is a simple one to make. Secure some blue litmus paper from your druggist,—five cents worth will be enough. Cut a round piece of clean white blotting paper to fit tightly in the bottom of an ordinary drinking glass. Place the litmus strip in the bottom of the glass and the blotting paper on top of the litmus paper, and then add soil which has been taken from the surface and sub-soil of different parts of the field. Add sufficient water to saturate the soil and cover the glass with a saucer. If the litmus paper remains blue your soil requires little or no lime. If it changes from blue to pink or red it may be taken as proof that the soil is acid or sour and is in need of lime.

Another simple way to test with litmus paper is as follows: Go into the field you desire to test, cut a slit in the moist ground and insert a piece of blue litmus paper in the slit, pressing the earth firmly around the paper. Let it remain a half hour, then remove and examine the color of the paper. If the litmus paper turns slightly pink, you should use no less than two tons of carbonate of lime per acre; if it turns a decided pink, apply at least three tons per acre; if red, apply four tons or more, per acre.

Besides correcting acidity, how else does lime help the soil?

It makes available the plant foods which are already in the soil. It is not an element and is therefore not an element of plant food. It is rather the key which unlocks the pantry door and makes it possible for the roots to secure the foods stored in this pantry, the soil.

How should limestone be applied to the soil?

It should be spread as evenly as possible. Some do this by hand with a light shovel from the wagon, others from small sized piles placed at convenient intervals,—others use a manure spreader set at lowest gear, while others use lime spreaders for this work.

Do you advise purchasing any fertilizer for Alfalfa?

No, if you have a good supply of barnyard manure you are advised not to buy fertilizer unless perhaps it is raw rock

phosphate. This, when mixed with manure, is often found to be a profitable investment. Mix about 100 pounds of raw rock phosphate with every ton of manure.

Which is best, fall or spring seeding to Alfalfa?

It all depends. In fall seeding the use of the land is not lost for you often get a full crop of some other sort of grain before seeding your alfalfa. In spring seeding the great enemy is weeds.

What nurse crop do you advise?

It is better to use no nurse crop with alfalfa, but if one is used the choice should be barley at the rate of about a bushel to the acre. For this purpose the beardless barley is best.

When barley is used as a nurse crop, do you let it ripen its grain?

No. Too much moisture would be taken from the ground and this would weaken the young alfalfa. It would also be apt to lodge and this would tend to smother out the young plants. Better make hay of the barley. You will find a pretty good profit in your beardless barley hay when fed to your animals; they like it and will eat it greedily.

Why is beardless barley the best nurse crop?

Because it will not shade the alfalfa too much. When it comes on it makes a good growth, thus discouraging foxtail grass and weeds. It makes an ideal nurse crop.

What about oats?

I have no high regard for oats as a nurse crop. If used, the oats should be very thinly seeded, not exceeding half what would ordinarily be used; harvest the oats very soon after the seed is fairly well formed, that is, before it is fully ripe.

Is Alfalfa ever sown in corn?

Yes, it is often sown with corn at the time of last cultivation in July. Some growers censure this plan, however, claim-

ing that corn robs land of too much moisture and that it shades it too much. If alfalfa seed were cheaper it might become a good practice to sow it in corn for soil improvement, turning it under the following year and again planting to corn.

I have had great success sowing alfalfa in sweet corn in August.

Suppose I wanted to follow corn or tobacco with a fall seeding of Alfalfa?

In the north it would be too late. A better way is to plant hairy vetch or common clover after harvesting the corn or tobacco; cut for hay the following spring, and then plow the stubble in preparation for alfalfa.

How about Alfalfa following early potatoes?

There is no better plan. Such land has been well loosened, weeds destroyed, and when potatoes are dug the land is left clean. Level it off and disk it well. If it rains, disk it again.

Is it well for Alfalfa to follow grain crops?

It is a very common practice. Without plowing, the land can be disked and harrowed and put in excellent tilth. This should be done as soon as the grain crop has been taken off.

What are the worst crops for Alfalfa to follow?

Sorghum and kafir corn. They use up too much moisture.

I hear that dodder is a great enemy of Alfalfa.

It is and if it once gets a start it will ruin your crop.

How do you get rid of dodder?

Watch the alfalfa field closely and when dodder plants appear cut them with a sickle or scythe and burn them.

How about weeds in Alfalfa?

Little concern need be felt about the injurious effect of weeds, except quack grass and June grass. The cuttings of alfalfa three times during a season destroy practically all weeds.

The best method of getting rid of quack and June grass is to harrow your alfalfa fields each way with a spring tooth harrow. However, this method can not be used in the young alfalfa field as it will root up the plants. It can be used with perfect safety on all alfalfa fields of one or more years standing.

What makes Alfalfa turn yellow in spots?

Either the water table is too near the surface or the soil is too sour, or else the available nitrogen in the soil has been largely consumed by the alfalfa and it is receiving **no nitrogen from the air**; it is not inoculated; the necessary bacteria are missing. Again, it may be due to seeding too late in the fall or, possibly, to hardpan subsoil.

What is the remedy?

There is no remedy if the water level is within five feet of the surface or if the alfalfa roots are unable to penetrate the subsoil. If inoculation is needed, and the alfalfa has half a stand, the crop can often be saved by sowing 15 pounds of inoculated seed per acre and harrowing it in. If lime is needed, it must be supplied.

What are the main points to be observed in growing Alfalfa?

First, select land that is well drained.

Second, select land of at least average fertility.

Third, make sure the soil is not acid and if acid apply lime.

Fourth, prepare the seed bed as well or better than it is ordinarily prepared for any field crop.

Fifth, secure the right kind of seed.

Sixth, secure the right kind of germs for inoculating the seed.

How is the seed-bed for Alfalfa prepared?

First, plow deep at least three or four weeks before seeding.

Second, after plowing apply what lime is needed.

Third, harrow the ground well, both ways.

Fourth, use roller to make the seed bed firm and compact.

Fifth, later on, harrow and roll again. Do this until you have a finely-pulverized, compact, well-settled, seed-bed.

"Work it down like an onion bed."

When is it best to plow?

As a rule, during the fall or winter. For spring seeding of alfalfa, plowing should be as early as possible, so that the land will have time to settle. Never plant alfalfa immediately after plowing. There should at least be three or four weeks between plowing and planting in order to bring the top soil into capillary connection with the subsoil. You can easily see that should the top soil settle very much after germination sets in it would very likely ruin the tender roots of the plant. If you use lime, apply it right after plowing or after one dragging of the land, then disk and mix it well with the soil.

Is it best to plow deep for Alfalfa?

Yes, especially if the land is well-drained and limed. The soil plowed deep stores up that much more moisture, and more air circulates through it. This promotes the growth of the alfalfa bacteria that supply the plants with nitrogen. Deeper plowing means more nitrogen. Use your judgment, of course. If your soil is poor clay with only a thin layer of humus on top, plow a little deeper each year as humus is added to the soil.

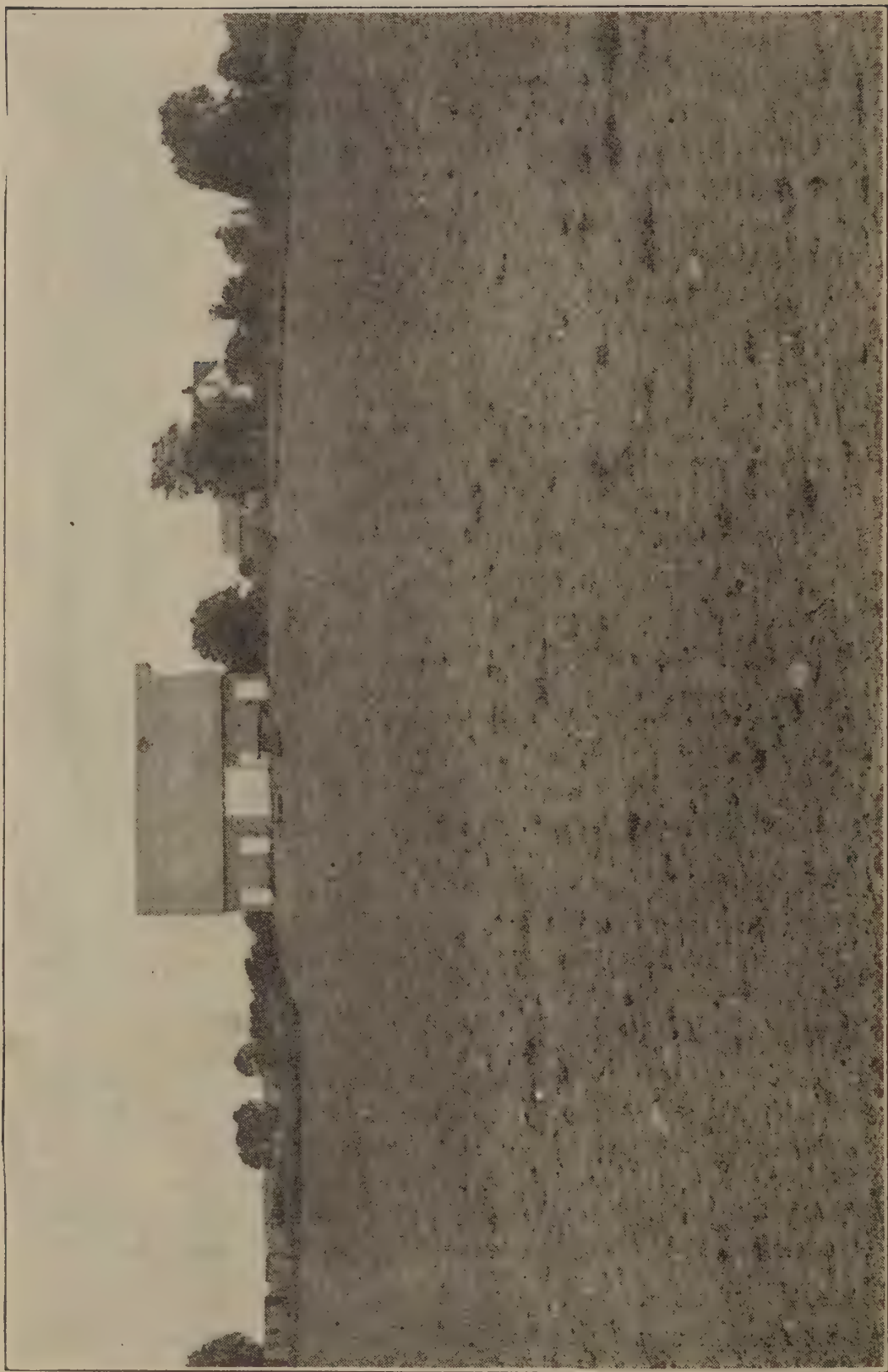
In France where some lands are as productive as ever, after being farmed for 800 years, they will plow 20 inches deep for alfalfa. If your land is hard or in poor tilth you should plow at least 7 inches deep.

What about Alfalfa seed?

Poor seed is the most expensive in the end, so buy the best. Buy of some reliable seed man. If there is time before seeding get a sample and test it, place 100 seeds on a moist piece of blotting paper on a pie pan. On this lay another moist blotter and place a piece of glass over the pan. At the end of a week count the seeds that have sprouted—85% to 95% should sprout.

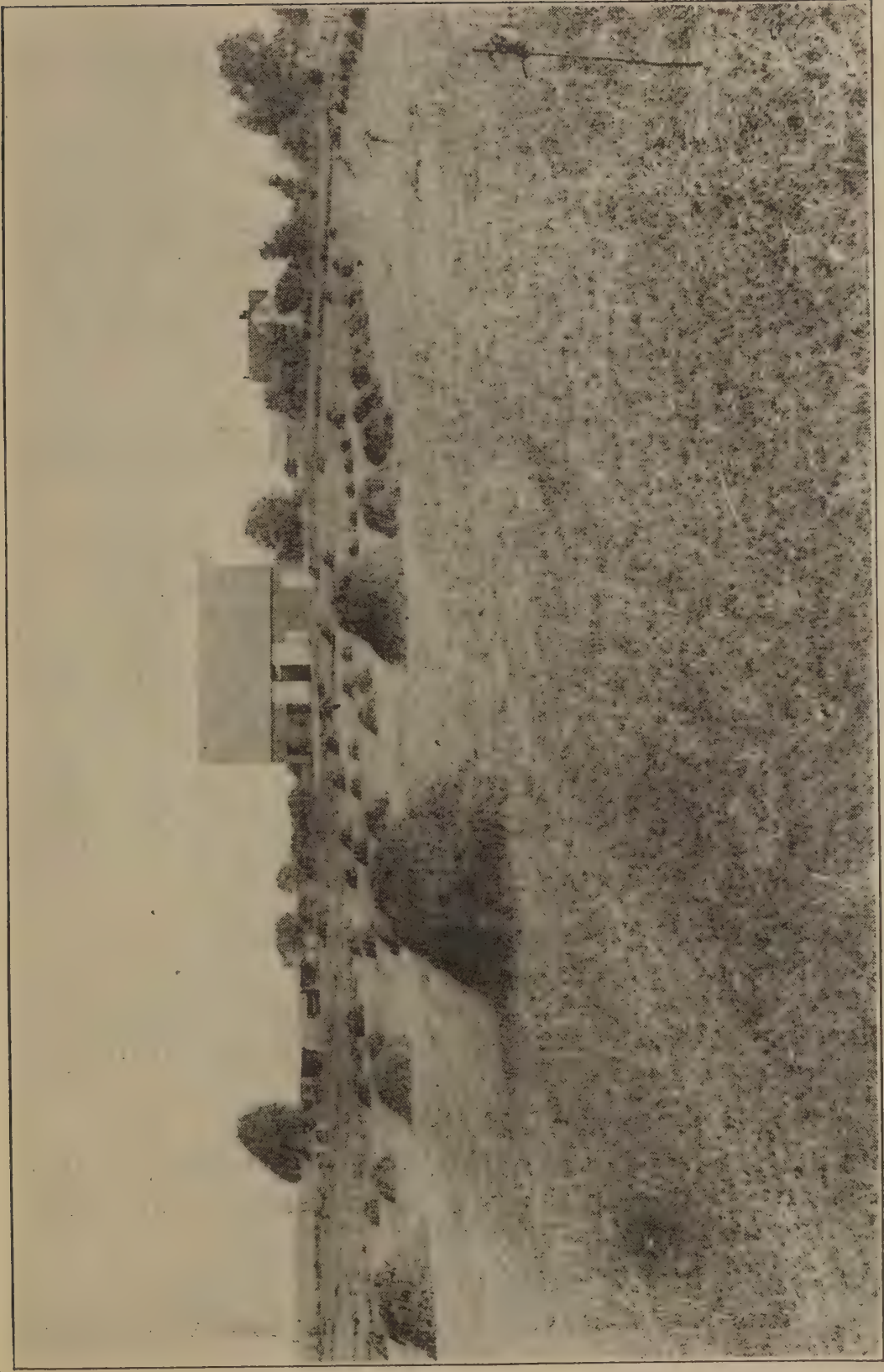
What kind of seed do you use?

The best seed I can get, avoiding the cheaper grades. Usu-



The above is a picture of my worn-out field after I sowed it to Alfalfa, Aug. 16, 1912. The soil was so poor that for six years I had a failure of every crop I attempted to grow on it. The soil is sand and gravelly and so rocky I found it impossible to plow much of it four inches deep.

On opposite page see picture I took of this same field 10 months later.



My first Alfalfa crop on worn soil, June, 1913. This is the same field shown in preceding picture.

It was the first Alfalfa field from which I ever received a full crop of

Alfalfa the first year after fall planting.

How I grew this splendid crop of Alfalfa is told further on. (See pages 29-30.)

ally the low grades of imported seed are polluted with weed seeds and other adulterations.

If possible, I buy alfalfa seed that came from a region where prevailing conditions are similar to those on my farm.

How many pounds of Alfalfa seed shall I plant to the acre?

Twenty pounds. Much more is often used and very often much less, but our advice, backed by the experience of many successful alfalfa growers, is twenty pounds of alfalfa seed per acre.

How is Alfalfa seed sown?

Either broadcasted in two directions or through a drill; whichever is most convenient.

When is the best time to cut Alfalfa?

One cannot judge by the bloom alone. It is safer to go by the little shoots that put out from the base of the stems near the earth; when these appear cut the alfalfa immediately; if cutting is delayed the shoots will become so high that they will very likely be cut off with the hay. Your alfalfa must not be cut before these shoots appear, or your alfalfa will become yellow, rusted, and unthrifty, and weeds and grass will very likely spring up and choke it. Every year there are hundreds of alfalfa fields either injured or completely ruined from having been cut at the wrong time.

How late should Alfalfa be cut the first year?

In the northern and cornbelt states your alfalfa had best not be cut after the first of September. Remember that a good growth to catch the snow and protect the crowns, is an absolute necessity.

Is it advisable to pasture Alfalfa?

Do not pasture late in the fall or during the winter. Better not pasture at all during the first three years, or until the alfalfa becomes thoroughly established.

Should Alfalfa hay be cured in cocks?

Yes, it avoids loss of leaves, which, if exposed to the sun,

dry quickly, become brittle and fall off. The leaves, remember, contain more than twice as much **protein** as the stems, hence the necessity of careful handling. The use of hay caps is a very profitable practice when curing the crop.

But do not let the hay cocks remain in the field longer than four or five days as they will smother out the alfalfa plants under them. Three or four days curing in the cock is generally sufficient.

What is the meaning of the word "Protein"?

Protein is that nitrogenous food element which largely determines the quantity of beef or milk a given feed will produce. It is the presence of different proportions of "protein" in various foods that makes the difference in their market value. The protein content of an average annual crop of alfalfa is four times as great as that of red clover and more than five times as great as that of cowpeas or corn.

Do Alfalfa and corn make a balanced ration?

Yes. Alfalfa is the muscle-building feed, corn is a fattening and heating feed. Together they make a practical balanced ration for any animal on the farm. With corn, alfalfa, and a silo, you are independent of high priced mill-feeds or other concentrates.

What are legumes?

All plants which bear their seed in a capsule or pod are called legumes. Among these are alfalfa, clover, peas, beans, vetch, lupines, serradella, etc.

What are nodules?

They are the little round bunches or knots which grow at the root of legumes when the legumes are inoculated. Scientists found that the nodules were the homes in which live millions on millions of micro-organisms or germs—germs so very small that they have to be magnified about 1,200 diameters to be seen by the eye of man. The farmer would never have discovered this fact. It remained for the scientist equipped with a microscope to discover it.

How shall I find out whether the germs are living in the Alfalfa roots or not?

Carefully dig up an alfalfa plant so as not to strip off any of its hair-like roots. If the alfalfa germs have inoculated the plant you can see the nodules they have built on the roots. In these nodules the germs live and multiply. These nodules are shaped like little grapes or seeds, and on alfalfa plants are found fastened to the little root hairs. They are about as large as clover seed, sometimes larger, and occur singly or in clusters. These germs nourish and strengthen the growing alfalfa plant by feeding it with nitrogen which they take from the air. They take this air-nitrogen and combine it with other substances, and this they feed to the alfalfa plant; what the plant does not need is stored up in the nodules. When the alfalfa is plowed under, these nodules, filled with germs and precious nitrogen, decay and the billions of germs along with their stored-up nitrogen are deposited in your soil. **This nitrogen was never in your soil before for it came from the air.** This added nitrogen amounts to from 100 to 200 pounds per acre, worth, at 20c a pound, the cost of commercial nitrogen, from \$20 to \$40 per acre.

The atmosphere rests on top of the ground. How do these germs living down in the Alfalfa roots get nitrogen from the air?

They get their nitrogen from the soil air. Air circulates through all cultivated soils.

Does the U. S. Dept. of Agriculture endorse the germ theory?

Yes, Farmers' Bulletin No. 278, says:

"Nitrogen can be taken from the air and added to the soil by means of legumes, but this takes place only when the roots of the leguminous plants bear bacteria nodules or tubercles. The amount of nitrogen that any particular legume can add to the soil depends upon the number and size of the tubercles on its roots."

Do vetch, clover, soy beans, and other legumes, need these germs?

They do. But each requires a different variety of the germs. These little nitrogen gatherers all belong to the same family, but each legume must have its particular strain, or variety. Every inoculated legume is fed on air-nitrogen, and when the legume crop is plowed under **all of this new nitrogen is added to the soil.** Even when the crop is sold and removed from the farm you still have added to your soil all the nitrogen in the nodules and roots of the plants. When the crop is cut and fed to your livestock the greater part of new nitrogen can be returned and added to your soil in the form of manure. Non-legumes, such as wheat, cotton, corn, potatoes, etc., use up the nitrogen that is already in the soil. This is why they are called Soil Robbers; this is why the growing of wheat on the same land year after year wears out the soil; this is why everybody today is told to rotate his crops and why some legume crop should be included in every rotation.

INOCULATION

What does inoculation mean as applied to Alfalfa?

It means artificially supplying the soil with the necessary germs, or bacteria.

BACTERIA

What is the name of these bacteria, or germs?

They are commonly known as nitrogen-fixing or nitrogen-gathering bacteria.

Are not these Alfalfa germs already in the soil?

They are seldom found in soils where alfalfa has never been grown. Then, again, your soil may contain them but not in sufficient numbers to do any good; or they may be in too feeble a condition to readily penetrate the alfalfa roots. This is why alfalfa so often fails.

How can I put these nitrogen-gathering germs into my soil?

There are two ways to do this:

SOIL TRANSFER

You can buy or borrow wagonloads of dirt from some other farm where alfalfa is growing and scatter this over the field where you intend to plant alfalfa. This is called the soil transfer method.

PURE CULTURE

The other way to get these germs is to buy them as you do your seeds and put them into your soil by planting them along with your seed. This is the pure culture method.

Which method do you recommend?

The pure culture method, by all means.

Why?

For several reasons: With this method I have been more successful in securing strong, virile germs; germs that are able to penetrate the fine root-hairs of the plants and inoculate them; germs sufficient in number to do the work. I have also found it to be cheaper and safer for it has none of the dangers of the soil transfer method.

How is the soil transfer method dangerous?

Well, you can see for yourself that any borrowed dirt you scatter on your land must be clean and wholesome or you will be likely to introduce seed pests and destructive plant diseases into your soil. You should read Farmers' Bulletin, No. 315, wherein the United States Department of Agriculture warns farmers against the indiscriminate use of infected soil.

Where do you get your pure-culture Alfalfa germs?

I buy them put up in commercial form. The nitrogen-gathering germs are commercially known throughout Germany, the United States, and all agricultural countries in the world, as

"NITRAGIN"

This commercial pure culture I have used with so much success on my own farm that I do not hesitate to recommend it to every farmer in this country, not only for alfalfa but for vetch and other legumes.

NOTE:—"Nitragin" (pronounced ni-tra-gene) is manufactured by the German-American "Nitragin" Co., Milwaukee, Wis., but the writer purchased his "Nitragin" from a reliable seedsman. You can do the same. If not, drop a postal to the "Nitragin" Co., Milwaukee, and they will send you the address of the nearest dealer who handles it.

How are "Nitragin" germs put up?

The germs come in one-acre and five-acre cans containing material that is guaranteed to keep them alive until used, if used within six months from the time they are shipped. The contents of the one-acre can will inoculate enough alfalfa seed to sow an acre, the five-acre can, five acres.

Are the "Nitragin" germs planted along with the Alfalfa seed?

Yes, and you will see the great value of this further on.

How are they planted along with the seed?

You follow the directions that are printed on every can. They are very simple, a child 10 years old can follow them.

First, you empty the contents of a "Nitragin" can into a pail containing a given amount of water. Next, you stir and then pour the entire mixture on to your alfalfa seed so as to moisten every kernel. Then you spread seed out to dry. This leaves hundreds, very often thousands, of the germs sticking to every seed kernel. Then you plant your treated seed, putting germs and seed into the soil together. When the seeds sprout, the germs are close by and right at hand to do their work.

Is the "Nitragin" Method of planting the germs along with seed a better and surer way to inoculate Alfalfa than scattering infected soil over the field?

Yes, and I think I can make this as clear to you as daylight: Suppose you fill a bucket with soil from your farm, and in this you want to grow one inoculated alfalfa plant.

In this bucket of soil you plant one alfalfa seed, only one.

Suppose you have secured in some way just one alfalfa germ and you put this solitary germ into the bucket of soil. (Soil must not be sour or the germ will die. The germ must not be left on top of the soil or the sun will kill it.)

The seed sprouts and soon the root-hairs begin to grow and reach out in search of plant food. To inoculate the plant the germ must find one of the fine root-hairs, penetrate it, build its home in it (a nodule) and there multiply into thousands of germs.

Now here is the point: Which of the two methods would you use to put that germ in your bucket of soil?

Why, you would stick the one germ on to the one Alfalfa seed and plant them both together. Later, the germ would have a better chance of finding a hair-root to crawl into.

Exactly. You would not put your solitary germ into a spoonful of dirt and then scatter the dirt over the surface of your bucket of soil. In other words you would use, not the soil transfer, but the pure culture method of putting the germ into the soil.

The above is a fair illustration of the comparative value of the two methods, and if you tell me that the scattered dirt **may** contain many alfalfa germs, I answer this by telling you that **every alfalfa seed** after being treated with "Nitragin," carries into the soil hundreds and often thousands of alfalfa germs.

SOIL ROBBERS

Why are corn, wheat, rye, oats, potatoes, etc., called Soil Robbers?

Chiefly because they get their nitrogen from the soil, leaving it that much poorer every time a crop is taken off.

SOIL BUILDERS

Why are Alfalfa, vetch and all other legumes called Soil Builders?

First, because, being so deep-rooted, they are able to forage for plant foods that are below the reach of the shorter-rooted non-legumes. Thus they bring up from the subsoil considerable amounts of phosphorus and potash, which, when their roots decay, help enrich the top soil for the next short-rooted soil robber to feed on.

Second, because, when inoculated ("Nitragin"-treated), their luxurious growth, plowed under, adds rich organic matter to the soil, which is converted into humus.

Third, my third reason for calling alfalfa, vetch, and other legumes, Soil Builders, is so big, vital and fundamental, I will not state it off-hand. Let us first discuss nitrogen a minute.

NITROGEN

We all know what nitrogen is. Four-fifths of the air is nitrogen. As farmers we have used nitrogen fertilizer and we know how costly it is, for we paid from 15 to 20 cents per pound for it.

By the way, did it ever strike you that something was wrong in Nature's plans when you were compelled to hitch up and go to town to buy nitrogen, knowing there were millions of dollars worth of it resting on every acre of your farm? But you supposed, of course, that no plant, animal, or man could take the nitrogen out of the air and put it in your soil. Yet all the while, ever since life began, Nature has been doing this very thing.

How?

She does it in a manner so mysterious, that man never learned her secret until about 25 years ago. The secret was this:

THE LEGUME AND THE GERM

At the beginning of life on this planet, Nature created the pod-bearing plant, the legume. She also created a certain germ, the kind we have been discussing. By means of these two—the legume and the germ—she saw a way to take nitrogen out of the air and distribute it in the soil, so that plants could grow by feeding on it,—and then animals could feed on the plants, and man feed on the animals, enabling all living things to get their necessary amount of nitrogen.

So, Nature made, and still makes, these two—the legume and the germ—so that each depends very much upon the other for a living. She does this in order to perpetuate their co-partnership. She decrees that the germ will instinctively live and build its noded home in a root of the legume where it will find shelter from its enemies in the soil. Moreover, the legume must feed the germ and its thousands of offsprings with sugar and mineral salts and doubtless other things they love to eat.

Is this germ, then, a parasite?

No, indeed. It is about the busiest and most useful thing that Nature ever created.

In exchange for its bed and board in the legume root, the germ—through some power which Nature gives it—takes nitrogen from the air, feeds it to the legume until its tops and roots become rich in protein (nitrogen) and what the plant does not need the germ stores up in its nodule.

If you plow under a legume crop which the germs have fed with air nitrogen, then you **add** all of this new nitrogen to your soil. And now I have given you my third reason for calling legumes, Soil Builders.

If I do not properly inoculate my seed or soil will I fail to get a catch of Alfalfa?

Yes. The alfalfa plant turns yellow and sickly when there are no alfalfa germs in its root-hairs feeding it air-nitrogen. Inoculate with "Nitragin" for it is a dependable method. It is a good investment—a good insurance against failure. Alfalfa failure is costly; did you ever figure it up.

You lose the time, labor, and money you spent in plowing, disking, harrowing, and rolling to get your seed-bed in proper condition, and you lose your seed, the use of your land and a valuable crop of alfalfa besides.

Do these nitrogen-gathering germs live in the roots of wheat, grain, and other non-legumes?

No. Only in the roots of legumes.

Will "Nitragin" increase the yield of wheat, corn and other crops on my farm?

Yes. Indirectly. If you grow some "Nitragin"-ed legume, either in rotation or as a intermediary crop, this will increase the fertility, the producing power of your farm, and will give you bigger crops, no matter what you grow.

Would you grow and plow under Alfalfa for this purpose?

No. It is too valuable a crop.

What legume would you grow for its fertilizing value?

Hairy vetch is best to restore worn out soil. All legumes, however, have a remarkable fertilizing value.

Will "Nitragin" also inoculate vetch, clover, peas, beans, and the other legumes?

Yes. But each legume requires a different strain, or variety, of the germ. So when you order "Nitragin," be sure to state what legume you want it for.

Tell me more about "Nitragin," particularly your experience with it on your farm at Delphi, Ind.

To begin with, my worn soil was sand underlaid with coarse gravel. Sixty or seventy years ago when it was first subjected to cultivation its top soil was well supplied with organic matter and humus and produced bountiful crops. But after years of cultivation, without supplies of organic matter being given back to it, it had become a mere soil skeleton, nothing but the rock particles of the soil remained. The real flesh of the soil, the organic matter which soil bacteria feed upon and convert into food for growing corn, wheat, oats and the like, had

been consumed, and so I had the worn-out soil, or the soil that no longer produced paying crops.

Driven to find a cure for this sick, worn soil, I discovered that all that was necessary to do to make this soil well again, and prepare it for the bearing of its burden of crop growth, was to feed it. It was simply starving to death.

I had observed that when a fence was built across any portion of worn soil, and the fence row was neglected, old Nature would commence to grow in the neglected fence row first the weeds, then the grasses, and then innumerable trees, briars and undergrowth. This was Nature's effort to feed her starving soil with organic matter. She would have done the same thing on the cultivated lands if she had had the opportunity. Yet I was not making any new discovery, for the fact that an abundance of organic matter was the proper way to feed starving soils had been known to agriculture for ages. It was practiced by the Roman farmer more than two thousand years ago.

But I, my father and my neighbors, had lived the most of our lives on the rich soils of the corn belt, and had not been really up against the worn-soil problem, so our minds had not been directed in those channels that lead to soil investigation and experiment.

Finding out that organic matter was the chief need of my worn soil, in fact was the only thing that would restore it to fertility, then the question arose as to the kind of organic matter to be furnished, and how to produce it in abundance.

Of course my attention was called to alfalfa as being one of the best organic-matter producing plants,—not alone for its ability to produce, through its large root system, an abundance of this material,—but it also has the power through its root nodules and bacteria to draw from the air large supplies of the most costly and the most precious element needed in our soils, nitrogen.

At that time the importance of inoculation was not made so prominent as it is now, and I simply planted my alfalfa seed in the soil without making any effort towards inoculation, and of course, my first experiment in growing alfalfa was not

a success. It not only took several years for the alfalfa to establish itself, but even then it did not produce the large paying crops.

My attention was called to the artificial cultures. I had a piece of worn soil upon which, the first year I owned it, I attempted to grow a crop of garden peas. This soil was of a sandy, gravelly nature, a portion of it being so rocky it was impossible to plow it more than four or five inches deep. My pea crop of course was a failure. I then tried corn upon this piece of land and that crop was a failure. I then planted it to brome grass, and although I kept the soil in this grass for several years, the returns from it was practically nothing. So then I thought I would see if I could grow alfalfa upon this soil.

In the mid-summer of 1912 I plowed it as deep as possible, worked the soil down well, and removed the rock from it, and a portion of the soil I gave a top dressing of manure; but on one-half of the field I applied no manure whatever as I wanted to experiment with "Nitragin."

A picture of this portion of the field is shown on page 16.

About the middle of August, 1912, I secured the best alfalfa seed I could purchase. I secured "Nitragin" and applied the same to the seed strictly according to directions, but was careful to see that the seed was sown and covered with as little sunshine reaching the seed as possible.

I was much gratified with the results of this sowing. The alfalfa came up within a few days. In less than four weeks it had reached the height of seven or eight inches, it being thrifty and of a healthy color. I have never had alfalfa to do as well before. This field went into the winter with the alfalfa at least twelve inches high, and in January following its sowing, nodules could be found on the roots of every plant that I would dig up in any part of the field, and the alfalfa was as fine on the unmanured portion of the field as upon that portion of the field which had received the top dressing of manure, which convinced me that the "Nitragin" had inoculated all the alfalfa.

When I examined the roots in January to see if they were inoculated, I also examined the roots of some alfalfa growing on some of my older fields, and could not find on them an abundance of nodules, which shows that these fields were poorly inoculated, and they had been sown without any inoculation being applied.

In early spring the inoculated field of alfalfa began to show signs of great activity. All the alfalfa plants grew vigorously, and by the middle of June the first crop of alfalfa was the largest and best I ever grew upon my farm. I had secured for the first time a fine crop of alfalfa from the first cutting. This I had never been able to do before until after the alfalfa had been established at least two or three years. This was another fact which convinced me that "Nitragin" had done its work well.

Look at the picture on page 17 and you will see my field of worn-out soil as it looked after I had made my first cutting of alfalfa on it, June, 1913. This is the same field, remember, that is shown in first picture. Thus inside of ten months this poor, worn-out soil was transformed into a valuable piece of alfalfa land. And there is no question in my mind but what this transformation was due to the alfalfa plants being properly inoculated.

In the fall of 1913 I seeded two fields to alfalfa side by side, same character of soil, the one was inoculated with "Nitragin," the other was not. Upon the field that was inoculated, I had made one attempt to grow alfalfa which resulted in a complete failure. It was only here and there that I had an alfalfa plant, and even they were sickly in color and stunted in size.

But the new seeding with the inoculation went into the winter in as fine a condition as any alfalfa I ever grew, and the alfalfa upon the field that I did not inoculate, I fear will be a failure, at least it had that appearance when it went into the winter.

Upon none of these fields about which I am writing, had I ever applied limestone or lime, but my soil was not in need of lime, as a government expert had made tests of the soil in all these fields for acid with litmus paper, and he told me

that they were not in need of lime, and in fact, I had never seen any plants growing upon them that would indicate that they were sour.

From these experiments I can reach but one conclusion, and that is, that there is merit in "Nitragin," and that it will pay any one to use it if he intends to grow alfalfa. I do not hesitate to recommend its use, and would further add that all alfalfa growers should, if possible, use every method and procedure recommended by competent authorities for growing alfalfa, like drainage, deep plowing, manuring, liming and application of rock phosphate, inoculation, etc., because the alfalfa crop is so valuable that we can afford to do any thing that is likely to make the crop a sure success.

SOME ALFALFA DON'TS

Don't try to save money by purchase of cheap seed.

Don't sow old seed or seed that is adulterated.

Don't throw money away by seeding on recently plowed land, no matter how carefully prepared. (Nothing less than a miracle will save a crop sowed on new plowing.)

Don't follow sorghum or kafir corn with alfalfa.

Don't sow on bottom lands or fields poorly drained.

Don't plant where the water table is nearer the surface than five feet.

Don't plant without first treating seed with "Nitragin." In other words, do not risk planting uninoculated seed (the crop may start off all right, but if the germs are not in the soil, it will soon die out).

When using inoculated seed, do not expose the seed to the sun after they are treated.

When planting inoculated seed, prefer a cloudy day or plant early in the morning or late in the afternoon. (If drill is used these precautions are less important.)

Don't spread weed seeds or disease by transferring soil from an old field.

Don't allow the land to crust, it may kill the tender young plants.

Don't leave the field rough, use roller or plank to smooth the field.

Don't let grass or weeds get over six inches high without clipping.

Don't clip or mow while the dew is on.

Don't let the sun dry or burn the leaves after the hay is cut. (The hay will not be well cured if the leaves get dry.)

Don't be afraid to harrow a field that has a second year stand. Don't wait for the plants to stool. Alfalfa does not stool.

Don't pasture an alfalfa field until it is well established and then do not over pasture.

Don't allow rain or dew to spoil the market value of the hay; use hay caps.

Don't try to save seed in humid sections of the country.

Don't save seed from a field troubled with dodder or noxious weeds.

If harvesting for seed, don't thresh the first crop—take the second or third.

If harvesting for seed, thresh from the field; if obliged to stack, let the hay get drier than when harvesting for the purpose of saving hay only.

Don't forget that alfalfa balances the corn ration.

Don't forget that it gives you increased yields from crops that follow.

Don't forget that it yields from two to three times as much as clover or timothy and makes a more valuable hay.

DON'T FORGET

That no matter where your farm is or what your cash crops are, alfalfa will make you bigger crops, fatter stock and larger and quicker cash returns from your farm than any other crop you can grow.

The Belleville National Bank

BELLEVILLE, PA.

**Please Accept this book with
our compliments.**

**We are always interested in
the welfare of our farmer
friends and we hope you will
study this book and put into
practice its teachings.**